

75 Ω , Differential RF Amplifier 5 - 1800 MHz



MAAM-011297

Rev. V1

Features

- Single Stage, Differential Amplifier
- 5 V, 290 mA Operation
- 17 dB Flat Gain
- Low Noise
- Low Distortion Performance
- Lead-Free SOIC-8EP Plastic Package
- RoHS* Compliant

Applications

- CATV Infrastructure

Description

The MAAM-011297 is high gain, high linearity and low noise differential RF amplifier assembled in a SOIC-8EP plastic package. This amplifier provides 17 dB of flat gain with very low noise figure. The differential push-pull topology provides superior 2nd order intermodulation performance.

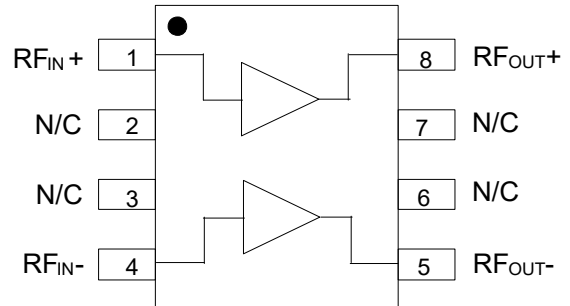
The MAAM-011297 provides high gain, low noise and low distortion making it ideally suited for 75 Ω infrastructure applications.

Ordering Information^{1,2}

Part Number	Package
MAAM-011297	Bulk
MAAM-011297-TR1000	1000 piece reel
MAAM-011297-TR3000	3000 piece reel
MAAM-011297-001SMB	sample board

1. Reference Application Note M513 for reel size information.
2. All production sample boards include 5 loose parts.

Functional Schematic



Pin Configuration^{3,4}

Pin #	Pin Name	Function
1	RF _{IN+}	RF Input +
2, 3	N/C	No Connection
4	RF _{IN-}	RF Input -
5	RF _{OUT-}	RF Output - / V _{DD}
6, 7	N/C	No Connection
8	RF _{OUT+}	RF Output + / V _{DD}

3. The exposed pad centered on package bottom must be connected to RF and DC ground.
4. All pins listed as "No Connection" are not connected electrically inside the package.

* Restrictions on Hazardous Substances, compliant to current RoHS EU directive.

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Electrical Specifications: $T_A = 25^\circ\text{C}$, $V_{DD} = 5\text{ V}$, $Z_0 = 75\ \Omega$

Performance specified with input/output balun MABA-011112.

Parameter	Test Conditions	Units	Min.	Typ.	Max.
Gain	5 - 1800 MHz	dB	—	17.0	—
	50 MHz		15.9	17.0	19.0
	1218 MHz		16.0	17.0	19.0
	1800 MHz		15.4	16.8	19.5
Tilt	5 - 1800 MHz	dB	—	0.4	—
Reverse Isolation	5 - 1800 MHz	dB	—	21	—
Input Return Loss	5 - 1800 MHz	dB	—	18	—
Output Return Loss	5 - 1800 MHz	dB	—	18	—
Noise Figure	45 MHz	dB	—	2.0	—
	1800 MHz		—	3.5	—
Output IP2	5 - 1800 MHz, tone spacing 6 MHz P_{OUT} per tone = +13 dBm	dBm	—	60	—
Output IP3	5 - 1800 MHz, tone spacing 6 MHz P_{OUT} per tone = +13 dBm	dBm	—	42	—
P1dB	5 - 1800 MHz	dBm	—	24	—
Composite Triple Beat, CTB	79 channels, 0 dB Tilt, 39 dBmV per channel output, QAM to 1000 MHz	dBc	—	-74	—
Composite Second Order, CSO	79 channels, 0 dB Tilt, 39 dBmV per channel output, QAM to 1000 MHz	dBc	—	-75	—
I_{DD}	$V_{DD} = 5\text{ V}$	mA	—	290	350

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Maximum Operating Ratings^{5,6}

Parameter	Absolute Maximum
Input Power	10 dBm
V_{DD}	7 V
I_{DD}	400 mA
Operating Temperature	-40°C to +85°C
Junction Temperature ^{7,8}	150°C

5. Exceeding any one or combination of these limits may cause permanent damage to this device.
6. MACOM does not recommend sustained operation near these survivability limits.
7. Operating at nominal conditions with $T_J < 150^\circ\text{C}$ will ensure $\text{MTTF} > 1 \times 10^6$ hours.
8. Junction Temperature (T_J) = Case Temperature (T_C) + $\Theta_{JC} \cdot (V \cdot I)$
 Typical thermal resistance (Θ_{JC}) = 29°C/W.
 - a) For $T_C = 25^\circ\text{C}$,
 $T_J = 67^\circ\text{C}$ @ 5V, 290 mA
 - b) For $T_C = 85^\circ\text{C}$,
 $T_J = 127^\circ\text{C}$ @ 5 V, 250 mA

Absolute Maximum Ratings^{5,6}

Parameter	Absolute Maximum
RF Input Power CW	27 dBm
V_{DD}	10 V
Storage Temperature	-55°C to +150°C

Handling Procedures

Please observe the following precautions to avoid damage:

Static Sensitivity

Integrated Circuits are sensitive to electrostatic discharge (ESD) and can be damaged by static electricity. Proper ESD control techniques should be used when handling these (HBM) Class 1C devices.

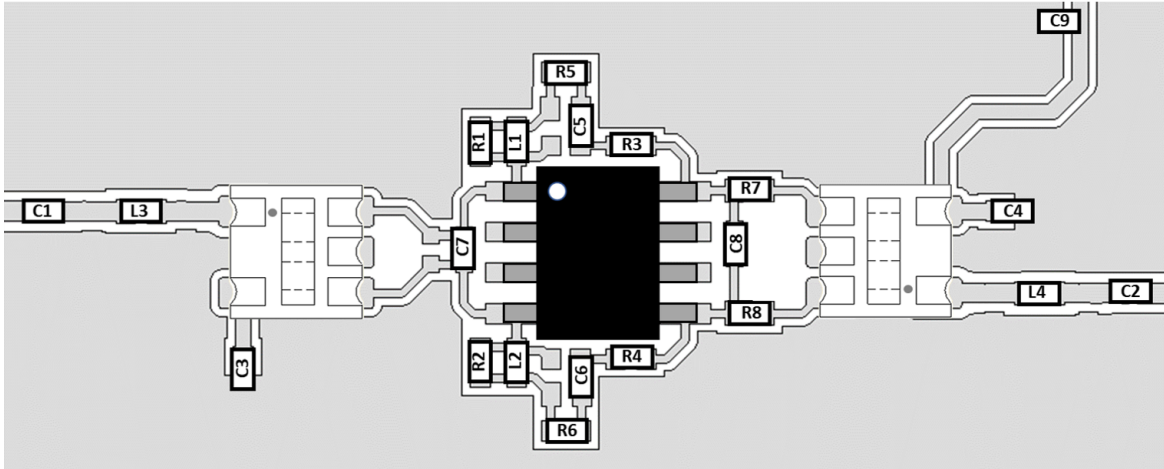
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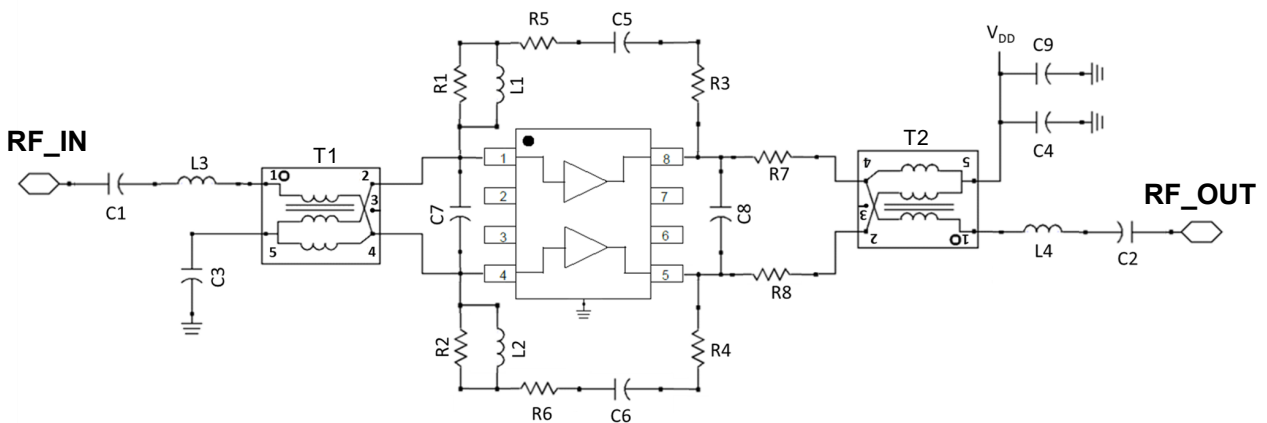
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Recommended PCB Layout



Schematic Including Off-Chip Components⁹



9. Pin 3 of MABA-011112 is an unconnected pin.

Parts List

Component	Value	Package	Component	Value	Package
C1 - C6, C9	10 nF	0402	R1, R2	45.3 Ω	0402
C7	0.5 pF	0402	R3, R4	82 Ω	0402
C8	0.7 pF	0402	R5, R6	270 Ω	0402
L1, L2	22 nH	0402	R7, R8	0 Ω	0402
L3	1.8 nH	0402	T1, T2	1:1 Balun ¹⁰	—
L4	1.5 nH	0402			

10. MABA-011112

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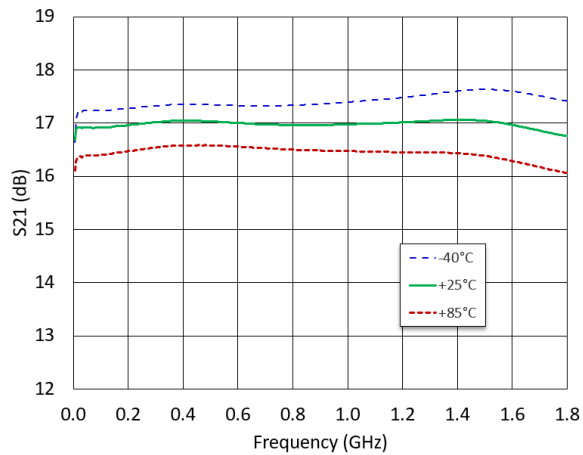


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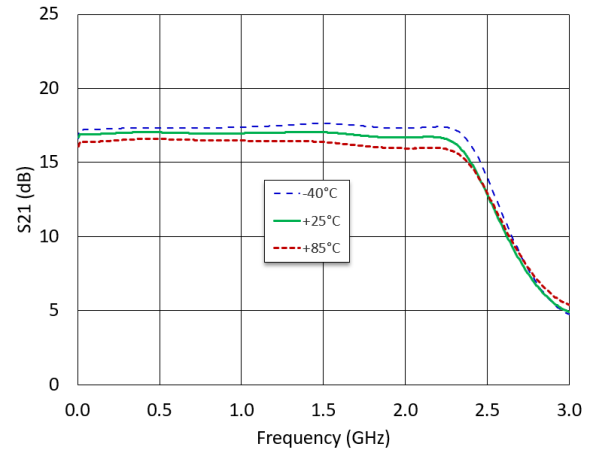
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Typical Performance Curves: $V_{DD} = 5\text{ V}$

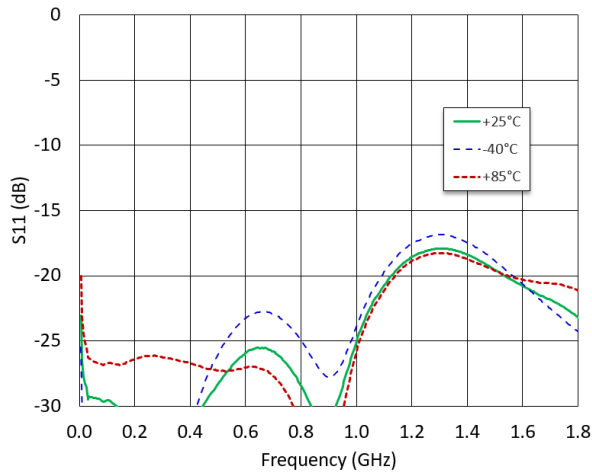
Gain



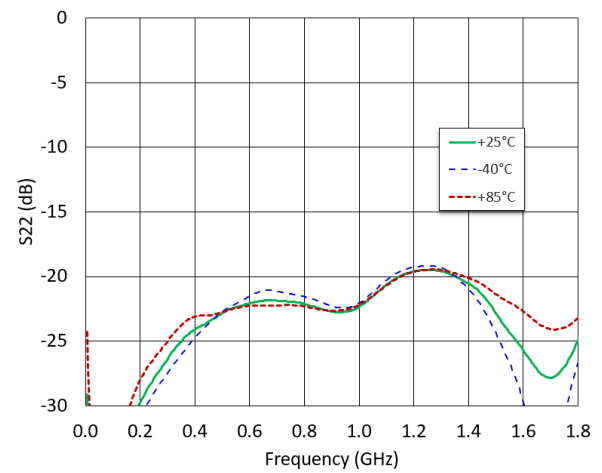
Gain to 3 GHz



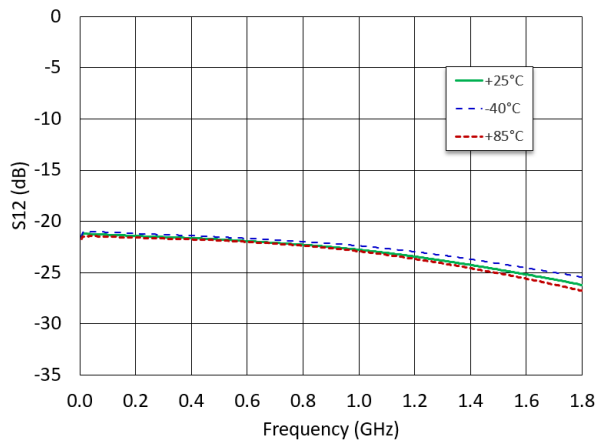
Input Return Loss



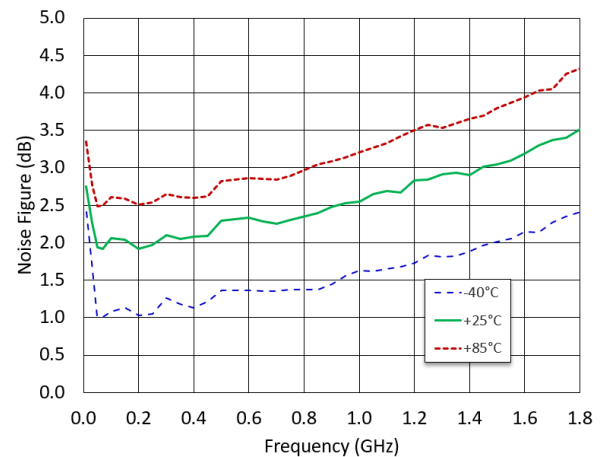
Output Return Loss



Reverse Isolation

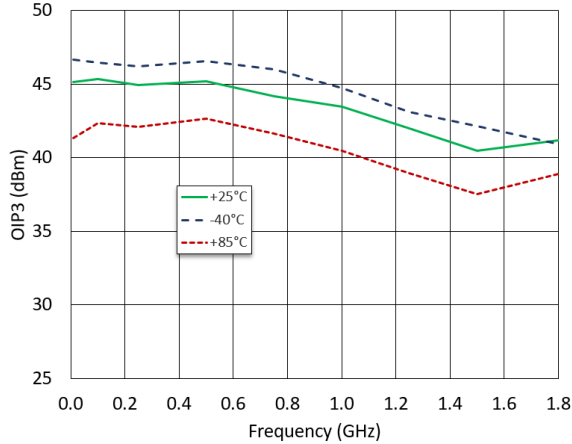


Noise Figure

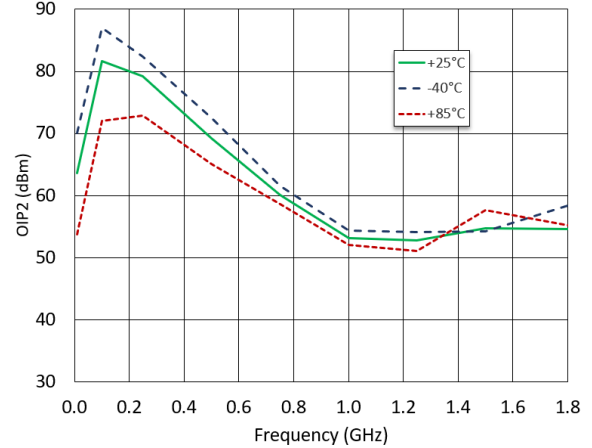


Typical Performance Curves: $V_{DD} = 5 V$

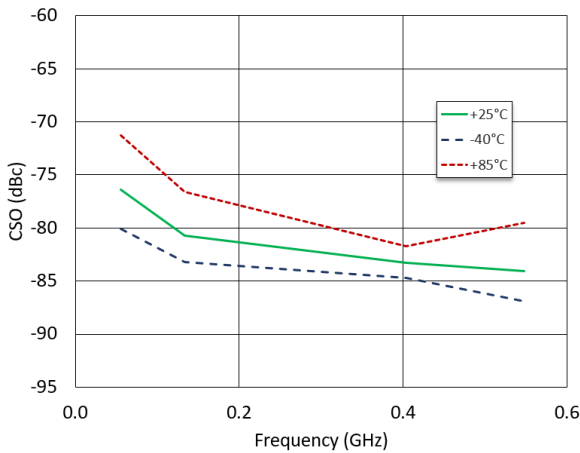
OIP3, $P_{OUT} = +13 \text{ dBm/tone}$



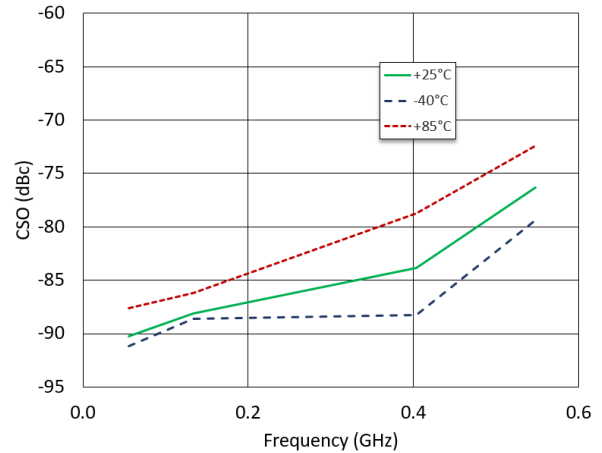
OIP2, $P_{OUT} = +13 \text{ dBm/tone}$



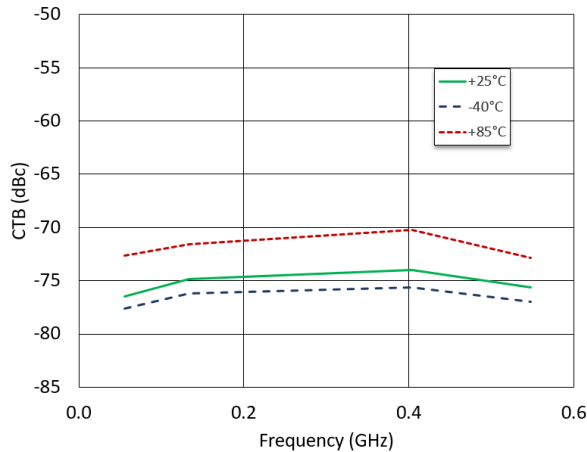
CSO Lower, 79 channels + QAM to 1 GHz, 0 dB tilt, 39 dBmV per channel



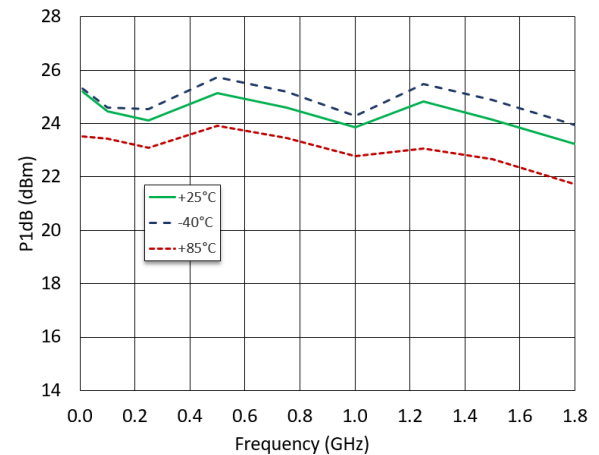
CSO Upper, 79 channels + QAM to 1 GHz, 0 dB tilt, 39 dBmV per channel



CTB, 79 channels + QAM to 1 GHz, 0 dB tilt, 39 dBmV per channel



P1dB



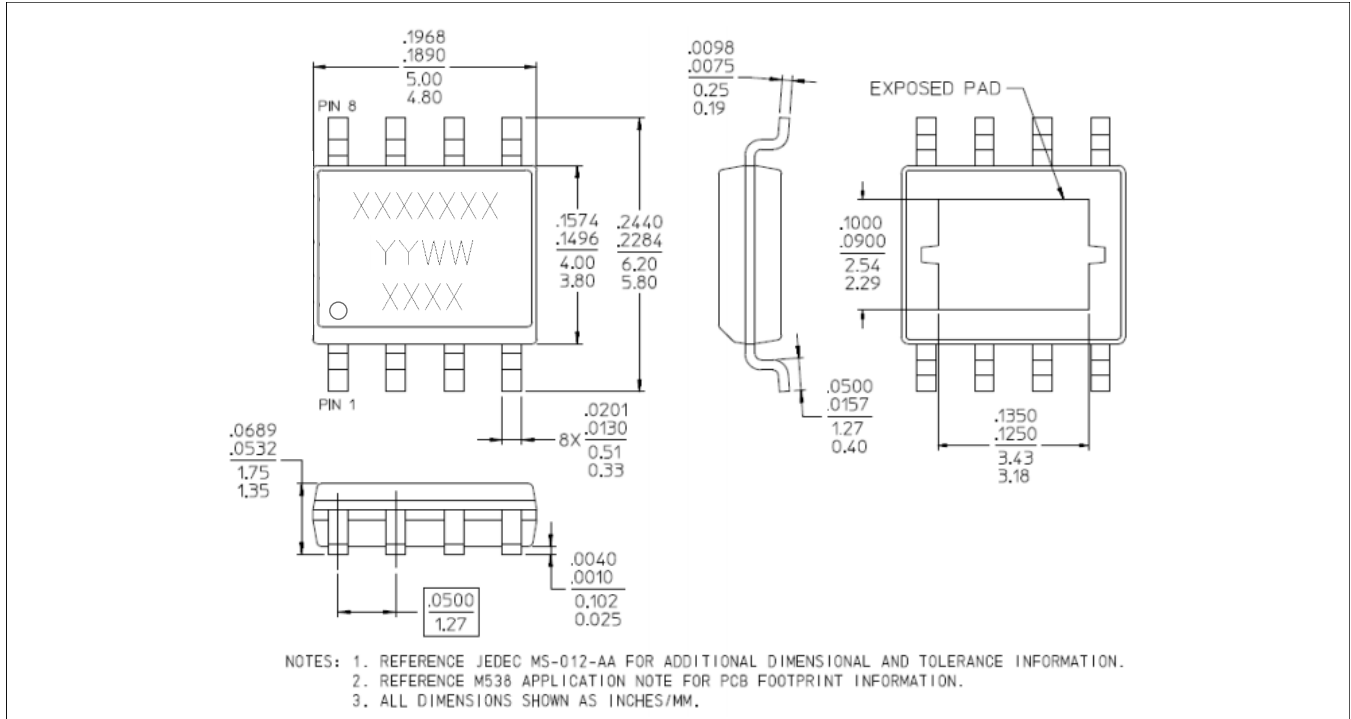
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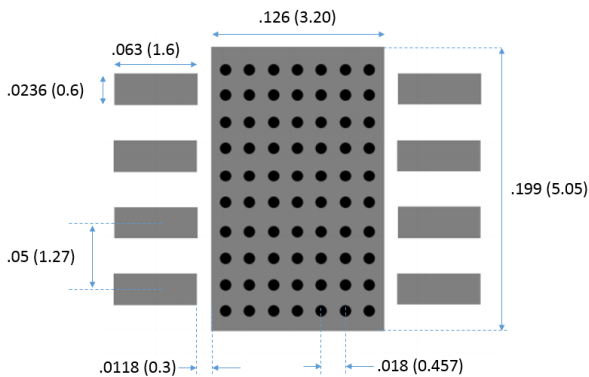
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SOIC-8EP[†]



[†] Reference Application Note S2083 for lead-free solder reflow recommendations.
Meets JEDEC moisture sensitivity level 1 requirements.
Plating is 100% matte tin over copper.

Recommended PCB Land Pattern



70 ground vias
0.008 inch finished hole diameter
All dimensions shown as inches (mm)

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